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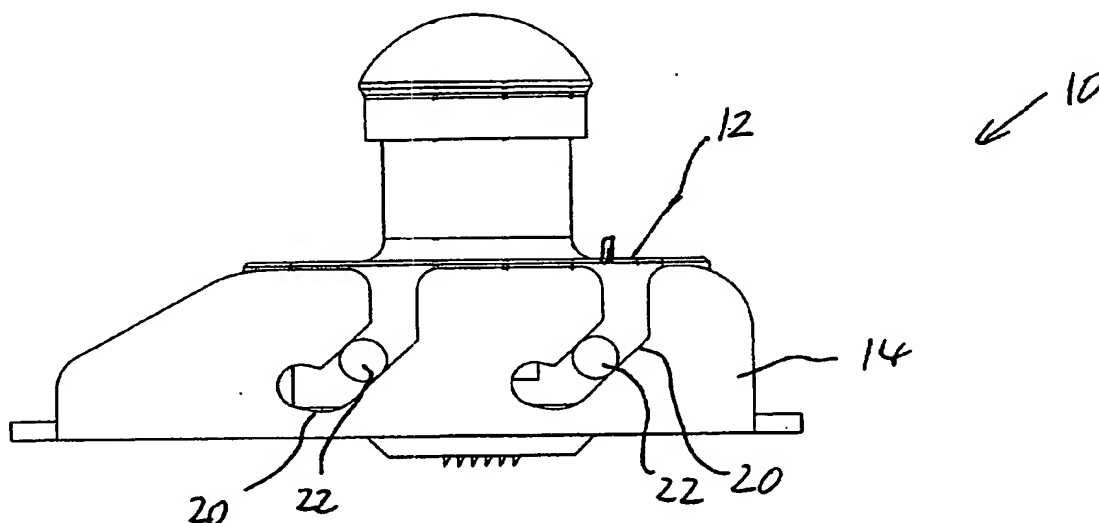
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[Continued on next page]

(54) Title: DEVICES AND METHODS FOR TRANSPORTING FLUID ACROSS A BIOLOGICAL BARRIER



(57) Abstract: A device (10) and method for transporting fluids across biological barriers enhances penetration of a biological barrier by the use of directional insertion, preferably with asymmetric microneedles (18) and/or microneedles (18) with sharp edges. Additionally, or alternatively, adhesion followed by alteration of contact geometry is employed to stretch the biological barrier across the microneedles (18), thereby also enhancing penetration. Also disclosed is a device (10) and method which combine shallow penetration by hollow microneedles (18) with jet injection via the microneedles (18) to achieve a total liquid penetration depth greater than the mechanical penetration depth of the microneedles (18).



— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/IL98/0165

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : A61M 37/00, 1/00
US CL : 604/22, 27

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : Please See Continuation Sheet

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Please See Continuation Sheet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X, E --- Y, E	US 6,589,202 B1 (POWELL) 08 July 2003, see entire document.	1, 5, 7, 8, 13, 17, 19, 20, 22, 26-29 and 32- 35 10, 11, 23 and 24
X, E	US 6,537,242 B1 (PALMER) 25 March 2003, see entire document.	26-28 and 32-34
X	US 5,309,909 A (GADSBY et al) 10 May 1994, see entire document.	1, 10, 11, 13, 22-24, 26, 27, 32 and 33
Y	US 5,618,295 A (MIN) 08 April 1997, see entire document.	12, 25, 31 and 37
X	US 5,879,326 A (GODSHALL et al) 09 March 1999, see entire document.	13 and 17
Y	US 6,183,489 B1 (DOUGLAS et al) 06 February 2001, see Figure 14 and entire document.	16

☒ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

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"&" document member of the same patent family

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INTERNATIONAL SEARCH REPORT

PCT/03/00165

C. (Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y, E --- A, E	US 6,565,532 B1 (YUZHAKOV et al) 20 May 2003, see entire document.	10, 11, 23, 26-28 and 32-34 ----- 1-9, 12-22, 24, 25, 29-31 and 35-52
X	US 6,319,230 B1 (PALASIS et al) 20 November 2001, see entire document.	38, 41-43, 45, 46 and 49-52
A	US 5,520,639 A (PETERSON et al) 28 May 1996, see entire document.	38-40, 44-46, 48, 51 and 52
A, E	US 6,591,124 B2 (SHERMAN et al) 08 July 2003, see entire document.	1-52
A	US 6,332,875 B2 (INKPEN et al) 25 December 2001, see entire document.	26-28 and 32-34
A	US 6,334,856 B1 (ALLEN et al) 01 January 2002, see entire document.	1-52
A, E	US 6,558,361 B1 (YESHURUN) 06 May 2003, see entire document.	1-52
A	US 6,132,755 A (EICHER et al) 17 October 2000, see entire document.	1-52

INTERNATIONAL SEARCH REPORT

PCT/IL03/00165

Continuation of B. FIELDS SEARCHED Item 1:

604/22, 27, 19, 21, 30, 36, 46, 47, 48, 500, 506, 521, 522, 93.01, 115-118, 131-137, 140-147, 149-157, 164.04, 164.12, 174, 180, 181, 246, 264, 272, 307

Continuation of B. FIELDS SEARCHED Item 3:

EAST

search terms: microneedles, high pressure or jet injection, vibration of fluid delivery conduit, arcuate or angled displacement of microneedles